REMARKS

No claims have been amended, added or canceled. Accordingly, claims 1-11 and 13-40 remain pending, with claims 1, 5, and 9 in independent form.

Allowable Subject Matter

Applicants thank the Office for indicating that if rewritten in independent form, claims 16-20 would be allowable. Although Applicants have not rewritten these claims at present, Applicants reserve the right to do so in future.

Claim Rejections – 35 U.S.C. § 103(a)

Claims 1, 2, 4-10, 13-15, 21, 22, 24-27, 29, and 32-37 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Augusto (U.S. Patent Application Publication No. 2002/0101895, "Augusto '895") in view of Augusto (U.S. Patent No. 7,521,737, "Augusto '737"). In addition, claims 3, 5-8, 23, 28, 30, 31, 33, 36, and 39 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Augusto '895 in view of Augusto '737 and further in view of Major et al. (U.S. Patent No. 5,689,123, "Major").

Independent claims 1, 5, and 9 each recite radiation detectors that feature a semiconductor body having an "active region [that] comprises a plurality of functional layers," where "the semiconductor body corresponds to a PIN diode structure." The Office contends that Augusto '895 discloses, at paragraphs 0175-0191, a radiation detector having a semiconductor body with an active region that includes a plurality of functional layers. *Office Action*, p. 2. The Office acknowledges that Augusto '895 does not disclose that the semiconductor body corresponds to a PIN diode structure, but contends that Augusto '737 "discloses that the detector semiconductor body corresponds to a PIN diode structure," and states moreover that "it would have been obvious … to modify Augusto ['895] by using a PIN diode structure for advantages such as integrating PIN devices with CMOS on a common substrate according to the teachings of August ['737]." *Id.*, p. 3. Applicants respectfully disagree, for at least the following reasons.

1. A person of ordinary skill in the art would not have combined Augusto '895 and Augusto '737

Applicants do not agree with the Office that it would have been obvious for a person of ordinary skill in the art to modify the light sensing device of Augusto '895 so that the semiconductor body therein has a PIN diode structure, which the Office contends is disclosed in August '737.

Augusto '895's radiation detector is designed to measure wavelengths of light in a selected spectral band through "[s]elective injection/extraction of electrons or holes into/from a chosen energy level (subband) only, without injection or extraction into/from other energy levels (subbands)." Augusto '895, par. 0013. To achieve such selectivity and at the same time to achieve high fidelity imaging properties in his detector, Augusto '895 expressly discloses that the different active layers of his device should be stacked *vertically* on top of one another rather than positioned side-by-side:

> [L]ayers to detect different wavelengths, from the IR, Visible and UV spectra, can all be overlaid, *rather than positioned side-by-side* as with conventional color image-sensing. Overlaying the color filters provides perfect spatial correlation, for all the wavelengths being detected, and avoids artifacts such as "Moire patterns." *Id.*, par. 0177, emphasis added.

Thus, Augusto '895 makes clear that an important feature of his radiation detector is the *stacking of filter layers vertically* in the direction of incoming light.

However, Augusto '737's radiation detector uses a different geometry. In particular, Figures 1-8 of August '737 show a variety of light sensing devices, each of which includes p-doped and n-doped regions (e.g., "P-Well" and "N-Well," respectively) that form CMOS structures arranged in a lateral, or side-by-side, configuration. Positioned above these CMOS structures are layers that form HIP and PIN devices which are also arranged in a side-by-side configuration. In some embodiments (*see, e.g.,* Figures 1, 2, 6, and 8 of Augusto '737), the HIP and PIN devices even share certain layers that extend in the lateral direction.

Augusto '737 teaches that by using both HIP and PIN devices, his radiation detector can selectively detect a wide range of spectral wavelengths. In particular, Augusto '737's PIN diode can detect wavelengths in the SWIR band, while his HIP diode can detect wavelengths in the MWIR band. Augusto '737, col. 3, lines 18-35. Augusto '737's detector "can be operated as a PIN photo-diode when a certain bias condition is applied, or can be operated as a HIP photo-diode when another particular bias condition is applied." *Id.*, col. 4, lines 12-14.

Thus, the side-by-side arrangement of PIN and HIP devices is an important feature of Augusto '737's radiation detector, as it permits the detector to detect a wider range of wavelengths than would otherwise be possible using either a PIN or HIP device alone. Moreover, because "PIN devices are bipolar and thus require both types of doping, while HIP devices are unipolar and require only one type of doping .... [a] single epitaxial growth of the device layers for PIN and HIP ... photo-diodes is possible if the growth starts on silicon surfaces with complementary doping." *Id.,* lines 59-64. In other words, the side-by-side arrangement of PIN and HIP devices in Augusto '737's detector permits fabrication of both devices at the same time, simplifying the fabrication process.

However, the side-by-side configuration taught by Augusto '737 is in direct contrast to the vertical stacking of layers disclosed in Augusto '895, which is described by Augusto '895 as providing superior (e.g., "perfect") spatial correlation relative to prior art side-by-side configurations. A person of ordinary skill in the art, informed by Augusto '895 that such a vertical stacking arrangement provides superior imaging fidelity, therefore would not have referred to Augusto '737's disclosure at all to modify Augusto '895's detector. In particular, such a person would have recognized based on the teaching of Augusto '895 that modifying Augusto '895's detector to include a PIN diode structure in the manner of Augusto '737 leads to imaging aberrations such as Moire effects that Augusto '895 expressly seeks to avoid. Accordingly, Applicants submit that a person of ordinary skill in the art would not have modified the detector of Augusto '895 according to the disclosure in Augusto '737 as the Office contends.

2. Neither Augusto '895 nor Augusto '737 discloses an active region with a plurality of functional layers

Even assuming *arguendo* that a person of ordinary skill in the art would have combined Augusto '895 and Augusto '737 as the Office contends, the combination still would not yield the radiation detectors recited in claims 1, 5, and 9 at least because neither Augusto '895 nor Augusto '737 discloses a semiconductor body having an active region that includes a plurality of functional layers.

Referring to Figure 8A in Augusto '895 for example, Augusto '895's detector does not have a PIN diode structure with multiple functional layers in an active region, but instead features a series of PN diode structures stacked on top of one another. As would have been appreciated by a person of ordinary skill in the art, the n+ and p+ doped regions in Figure 8A do not form part of the *active* region in a PIN diode structure; they instead form the contact regions on either side of the active region. Thus, in Figure 8A, the layer identified as the "active layer" can have, at most, a single functional layer (e.g., corresponding to one of the band-gap layers), surrounded on both sides by n+ and p+ doped layers. For this reason, the structure of layers in Figure 8A corresponds not to a PIN diode structure with multiple functional layers within the active region, but to a stack of PN diode structures, each with a single active layer sandwiched between contact layers.

Moreover, in exemplary Figures 7A-7D of Augusto '895, the devices include *insulating* layers between the filter layers. As would have been appreciated by a person of ordinary skill in the art, PIN diode structures do not include insulators. To the contrary, PIN diode structures include an active intrinsic semiconductor region positioned between doped contact regions. Neither the active region nor the contact regions are insulating.

Referring to Figures 1-8 in Augusto '737 for example, Augusto '737's detector also does not have a PIN diode structure with multiple functional layers in an active region. Instead, each of Augusto '737's detectors includes a HIP device with an active region having a single functional layer, and a PIN device with an active region having a single functional layer.

Accordingly, even if the disclosures of Augusto '895 and Augusto '737 were combined by a person of ordinary skill in the art as the Office suggests, the combination of these references still would not yield a radiation detector having a semiconductor body with a PIN diode structure and an "active region [that] comprises a plurality of functional layers," as required by independent claims 1, 5, and 9.

3. Major does not cure the deficiencies of Augusto '895 and Augusto '737

Major, also of record in this application, does not cure the deficiencies of Augusto '895 and Augusto '737, at least because Major does not provide a reason for a person of ordinary skill in the art to combine Augusto '895 and Augusto '737, and because Major does not disclose a detector having a PIN diode structure with an active region that includes a plurality of functional layers.

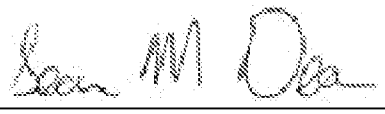
Conclusion

In view of the foregoing, Applicants submit that independent claims 1, 5, and 9, and also dependent claims 2-4, 6-8, 10-11, and 13-40 therefrom, are patentable over Augusto '895, Augusto '737, and Major. Applicants respectfully request reconsideration and withdrawal of the rejections of these claims under 35 U.S.C. § 103(a). Applicants ask that the application be allowed.

Canceled claims, if any, have been canceled without prejudice or disclaimer. Any circumstance in which Applicants have: (a) addressed certain comments of the Examiner does not mean that Applicants concede other comments of the Examiner; (b) made arguments for the patentability of some claims does not mean that there are not other good reasons for patentability of those claims and other claims; or (c) amended or canceled a claim does not mean that Applicants concede any of the Examiner's positions with respect to that claim or other claims.

No fees are believed to be due. Please apply any necessary charges or credits to Deposit Account 06-1050, referencing Attorney Docket No. 12406-0213US1.

Respectfully submitted,



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